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Terrarium Tales

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Abstract
Terrariums, clear enclosures with no drainage holes that mimic ecosystems by creating additional humidity, are a wonderful way to bring the power of nature into one's very own home or in areas that would otherwise not be suited for plants. If properly designed, terrariums can be enjoyed for years even if they are occasionally neglected. This paper addresses what to consider when constructing one and explains the reasoning behind such considerations. The paper's range of examples and techniques will give the reader the capacity to gain an accurate and deep intuitive understanding of a terrarium.

Faculty mentor: Lekha Sreedhar

Introduction

The frustrated, young woman's rain boots squeaked with every step as she marched into the brightly lit, plant nursery. As usual, she was making yet another trip to the nursery in search of a plant she could keep alive. This pattern had ensued for as long as she could remember: buy a plant from the nursery, kill it, buy a different plant from the nursery, kill it, repeat. "I've been trying to incorporate plants into my lifestyle for years," she thought to herself, "and I *still* have yet to succeed. What's wrong with me? There's got to be at least one, just one, single plant in this place that I can keep alive." Just before the woman reached the entrance to the nursery's outdoor greenhouse, a flash of light caught her eyes. It was light reflecting off a glass bowl, and not just any glass bowl, a glass bowl filled with a healthy, green miniature world. "A tiny, living ecosystem. That's genius!" she exclaimed. Little did the young woman know that she had just dug herself into another failure. She had just purchased instant death. Sure, the plants may look good for a few months, but after that? They'd be gone.

The supposedly "genius" bowl held a fatal flaw: a *Kalanchoe bossfeldiana. Kalanchoe bossfeldiana*, commonly known as Kalanchoe, ". . . is a dark green, succulent perennial with scallop-edged leaves and large umbels of flower clusters held above the foliage" (Missouri Botanical Garden, n.d.). As a succulent, this plant can store water in its leaves and thrive in full sun with minimal water. Terrariums are not built to support these types of plants; terrariums are designed for plants that do well in high humidity and shade. Unfortunately, I have personally witnessed many plant nurseries disregard this information, and people like the women in the story above blame themselves for their inability to care for the plants when, in fact, the

"professionals" are at fault. This experience has inspired me to research how a properly designed terrarium is constructed.

The Definition of Terrarium

The term, terrarium, carries many different meanings. According to the author of *The New Terrarium*, Tovah Martin (2009), "A terrarium is any transparent confine that allows you to nurture the elements of the green world" (p. 16). Another source defines a terrarium as ". . . a self-contained environment that produces its own climate" (SproutHome, n.d.), and a third reference states a terrarium is ". . . a garden in an enclosed glass container" (Dana, n.d.). In regards to this paper, a terrarium will be defined as a clear enclosure with no drainage hole that mimics an ecosystem by creating additional humidity. The water in the terrarium will begin in the soil then move up through the plants' roots, transpire off the plants' leaves, condense in the air, and finally precipitate back into the soil imitating the water cycle. This emulation of the water cycle should result with healthy plants and little maintenance.

The definition of a terrarium should not be confused with the definition of a dish garden. While these two types of plant, display containers share many similarities, such as the absence of drainage holes and the combination of various plant life, they create very different environments for their plant inhabitants. Whereas a terrarium with clear walls creates additional humidity, a dish garden which lacks walls will not generate moisture. A dish garden can also be placed in direct sunlight allowing sun loving plants, such as the succulent, Kalanchoe, mentioned earlier, to thrive in it, but a terrarium cannot be placed in direct sunlight because it would burn the leaves of its occupants. In summary, at the point, where a terrarium does not create additional humidity or burn the leaves of its residents when placed in full sun it becomes a dish garden.

It is also important to note the existence of both open and closed terrariums. Although open terrariums must be watered more often because humidity escapes, the ventilation reduces the probability of pest invasion and disease. Though closed terrariums do not need to be watered as frequently, they are more susceptible to the previously mentioned issues. "Theoretically, a closed terrarium shouldn't be prone to insect infestations. After all, it's sealed off from the world. . . " (Martin, 2009, p. 80); however, if fungus, mold, or insects such as aphids or mealy bugs infiltrate a closed terrarium, they will flourish in the warm, moist environment and become extremely difficult to eradicate. When choosing a container for a terrarium, take into account the qualities of these two types of terrariums.

The Structure and Construction of Terrariums

An important but easily overlooked factor to consider is where the terrarium will be placed. There are certain spots that will keep a terrarium healthy for the long run and other spots that will mean death to its inhabitants. Martin (2009) advises to place terrariums in an area that will give the plants inside bright, but not direct, sunlight. As discussed previously, if the terrarium is placed in direct sunlight, the glass will magnify the sun's rays and, essentially, bake the plants. Though terrariums should not be placed in any direct light, they can be placed outside if preferred. If the terrarium is outside, Martin (2009) reinforces that it should be kept in a shady location. On the other hand, if one chooses to keep the terrarium indoors, the terrarium should be placed away from vents, doors, or any other site that may result in sudden extremes in temperature. A steady, constant room temperature will encourage the plants to maintain steady, constant vigor.

As soon as the terrarium's location has been decided, the terrarium's container may be chosen. Terrariums can be created from almost any transparent container. *The New Terrarium* lists several examples of potential terrariums including cold frames, hand-glasses, cloches, Wardian cases, aquariums, bell jars, tureens, apothecary jars, and canning jars as just a handful of suggestions (Martin, 2009). If you're coming from a more financially wise or creative approach the doors open up even more. For instance, some of the terrariums in the book, *Terrariums Reimagained*, are built inside water bottles, old lightbulbs, and hanging glass bird feeders (Geiger, 2013). As long as the container fulfills its practical and aesthetic purposes, it will make a fine terrarium.

After the container is acquired, it will be filled with multiple layers. The first layer of a terrarium is the drainage layer. Terrariums do not have drain holes; therefore, a different kind of draining mechanism must be created. The drainage layer is crucial to terrariums because inadequate drainage may cause the roots of the plants to become water-logged and rot, "the drainage layer essentially prevents root rot, allowing water to pass through the soil instead of collecting around the roots" (Geiger, 2013, p. 16). Rocks, pebbles, or gravel will get the job done.

The following layer of a special type of charcoal known as activated charcoal will act as a natural filter and keep the terrarium fresh and clean. Activated charcoal is an adsorbent meaning it has the ability to hold molecules of a gas, liquid, or dissolved solid to the surface of itself (Merriam-Webster, n.d.). Thus, the activated charcoals' properties will prevent mold and bacteria from building up. This layer ". . . is particularly important in closed or mostly closed terrariums, as there is no natural air exchange" (Geiger, 2013, p. 16). Unfortunately, because an activated

charcoal piece's surface area can only hold onto so much, the charcoal must be replaced occasionally. This will mean more work for the owner of a closed terrarium, but, for the owner of an open terrarium, it will not be necessary. In an open terrarium, charcoal can be used at first for additional prevention of diseases such as mold and fungus until the plants are established in the terrarium. Once the charcoal can no longer do its job, there is no need to worry about replacing the charcoal because an open terrarium will have enough ventilation.

The subsequent layers will house the plants' root and shoot systems. I created numerous terrariums experimenting with different medias, plants, and glass containers. The goal was to create terrariums that would withstand time. In order to accomplish this, each plant had to be researched. The plants in the containers had to be compatible, small, shade-loving, and tolerant of high humidity. Although Fafard's 2B and 3B mix have the same ingredients (Canadian sphagnum peat moss, bark, perlite, vermiculite, dolomitic limestone, and wetting agent), Fafard's 2B mix was chosen to be used in all of the terrariums because this mix was found to hold less moisture than the 3B mix (Sungro, n.d.). As terrariums produce extra humidity and, therefore, keep the media very moist at all times, the 3B mix was not necessary. Fafard's 2B soilless media was not sterilized in any of the containers because all of the terrariums remained open and, therefore, not as susceptible to diseases. The following paragraphs will go into further detail for each terrarium.

The Experiments

The first terrarium was built inside a fish bowl and housed an African Violet. According to Martin (2009), "Members of this group like and need high humidity . . . They don't mind moisture, but they dislike water on the leaves" (p. 97). For this reason, "a ventilated case might

be better than a close cloche" (Martin, 2009, p. 97). The fish bowl provides the African Violet both humidity and ventilation. The bowl's wide lip also gives the owner easy access to the plant. This is critical for flowering plants because flowering plants, unfortunately, require more maintenance: "Patrolling for past blossoms before they brown and court mold can be a full-time job" (Martin, 2009, p. 99). Though the African Violet requires more upkeep than other non-flowering plants, the reward of its blooms is great. Of course, in order for these blooms to shine, the African Violet needs proper media. More perlite was added to Fafard's 2B soilless media to create an even more light-weight and porous media. Heavy mixes are undesirable because they "would easily crush the roots of African Violets. In addition, because heavy potting mixes hold so much water, they tend to leave African Violets vulnerable to such deadly pathogens as Crown Rot, Root Rot, and Pythium" (Optimara, n.d.). When put to the test, all of the factors researched above created a successful habitat for the African Violet.

The second terrarium harbored a *Sarracenia* (pitcher plant). The tall, open vase gave the plant just what it wanted: ". . . this bog plant prefers bright light, so an open mouthed terrarium is not only the ideal living environment but an effective meal ticket as well" (Martin, 2009, p. 93). To further reinvent the pitcher plant's boggy environment, sphagnum peat moss was mixed into the Fafard media as suggested by *The Savage Garden*: "*Sarracenia* thrive in a mix predominantly made of sphagnum peat moss" (D'Amato, 2013, p. 124). In order to help the media retain more moisture, it was topped off with pillow moss. The pillow moss as well as the pitcher plant and its environment have proved to mimic nature beautifully.

The large aquarium in Johnson County Community College's greenhouse has been filled with multiple plants including *Peperomia caperata* (emerald ripple); *Saxifraga stolonifera*

(strawberry geranium); *Adiantum raddianum* (Maidenhair fern); *Tradescantia spathacea* (Moses in the Cradle); *Billbergia nutans* (Queen's Tears); and *Cuphea hyssopifolia*. Fafard's 2B soilless media satisfied the needs of all of these plants, so no additional substrate was mixed into the media. The peperomia was chosen because not only do these plants thrive in low light conditions, but they also remain very small, two ideal traits for terrarium plants. The strawberry geranium likes high humidity and also has lovely foliage to offer. One of the larger plants, Maidenhair fern, was used to add height to the landscape. It acts as a tree among the shorter, shrub-looking plants (Martin, 2009). Moses in the Cradle and Queen's Tears were selected to represent tall grasses in the terrarium. Although neither of these plants were mentioned as potential candidates for terrariums, I chose to experiment with them. According to Guide to Houseplants (n.d.), they appreciate humidity and do not require direct sunlight. So far, they have worked nicely. Unfortunately, the *Cuphea hyssopifolia* did not work so nicely. *Cuphea hyssopifolia* was suggested to bring color to the terrarium with it's tiny purple flowers (Martin, 2009). This plant would have had no problem being trimmed if it had outgrown its confines of the terrarium, "Due to the fact that they're fond of being pruned, it's not difficult to keep Hawaiian heathers within bounds" (Martin, 2009, p. 113). However, the plant did not survive in this terrarium. Further research suggested that *Cuphea hyssopifolia* does much better in full sun than in the terrarium's low light conditions. Despite the absence of the *Cuphea hyssopifolia*, all of the multiple textures and shades of green from the other plants have made this terrarium beam.

Terrarium Care

Any well built terrarium will require some maintenance. The plants will eventually outgrow their space, so they will need to be trimmed. Open containers need to be watered more

often than closed terrariums. Any flowering plants will shed more debris than non-flowering plants and will, therefore, require more monitoring because "anything that's deteriorating will court fungal and bacterial infections" (Martin, 2009, p. 79). If one is concerned whether or not their plants are receiving enough nutrients, there is no need to fret. Terrariums don't require fertilizer because "the goal is to keep the plants diminutive and extra food would beef them up in a counterproductive way . . . However, if you've got an open vase or aquarium and the foliage of the plants inside begins to turn pale, by all means, give them some food. If you go that route, dilute the fertilizer liberally" (Martin, 2009, p. 76). Though terrariums may need some attention every once in a while, these terrariums will require much less work than plants not housed in terrariums.

Conclusion

Terrariums are a wonderful way to bring the power of nature into one's very own home. If properly constructed, they can be enjoyed for years even if they are occasionally neglected. Though terrariums offer perfect homes for an enormous variety of other plants, they are not the perfect home for every plant. The young woman in the opening story learned this lesson the hard way. At no fault of her own, the terrarium she purchased slowly fell to ruins. Nevertheless, she refused to admit defeat; she refused to give up. The young woman in the story researched the definition of terrariums. She investigated the structure of terrariums while constantly asking herself, "Why is this piece necessary? How does this function in the health of the terrarium?" Once she built her first successful terrarium, she did not stop: She wrote this very paper to share her terrarium tales.

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